

Juan Nathaniel

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Education

Columbia University

PHD, EARTH AND ENVIRONMENTAL ENGINEERING

- Advisor: Professor Pierre Gentine

New York

2021 - present

Columbia University

MS, EARTH AND ENVIRONMENTAL ENGINEERING

- Advisor: Professor Pierre Gentine

New York

2021 - 2023

National University of Singapore

BS, ENVIRONMENTAL SCIENCE

Singapore

2015 - 2019

Professional Experience

2023 Research Intern, IBM TJ Watson Research Center

2022 Research Intern, IBM TJ Watson Research Center

2019 - 2021 Research Engineer, Living Analytics Research Center

Publications

* denotes equal contribution

PUBLISHED

[1] **Nathaniel, J.** & Gentine, P. (2026). “Generative emulation of chaotic dynamics with coherent prior”. *Computer Methods in Applied Mechanics and Engineering (CMAME)*.

[2] **Nathaniel, J.***, Roesch, C.* , et al (2025). “Deep Koopman operators for causal discovery”. *In Press, Nature Communications Physics*.

[3] Herdeanu, B.* , **Nathaniel, J.***, Roesch, C.* , et al (2025). “CausalDynamics: A large-scale benchmark for structural discovery of dynamical causal models”. *Advances in Neural Information Processing Systems 38 (NeurIPS, Poster)*.

[4] **Nathaniel, J.**, et al (2024). “Chaosbench: A multi-channel, physics-based benchmark for subseasonal-to-seasonal climate prediction”. *Advances in Neural Information Processing Systems 37 (NeurIPS, Oral)*.

[5] Qu, Y.* , **Nathaniel, J.***, et al (2024). “Deep generative data assimilation in multimodal setting”. *Computer Vision and Pattern Recognition Workshop (CVPRW EarthVision, Best Student Paper)*.

[6] **Nathaniel, J.**, et al (2024). “Inferring failure risk of on-site wastewater systems from physical and social factors”. *npj Clean Water, Nature Publishing Group*.

[7] Kim, S*, **Nathaniel, J.***, et al (2024). “Spatiotemporal upscaling of sparse air-sea pCO₂ data via physics-informed transfer learning”. *Scientific Data, Nature Publishing Group*.

[8] **Nathaniel, J.**, et al (2023). “MetaFlux: Meta-learning global carbon fluxes from sparse spatiotemporal observations”. *Scientific Data, Nature Publishing Group*.

IN PREP / IN REVIEW

[9] **Nathaniel, J.**, et al (2025). “Multiscale stochastic parameterization with deep Mori-Zwanzig formalism”.

Awards, Fellowships, & Grants

2024 - 2025	Columbia-Dream Sports AI PhD Fellowship , Columbia University	\$ 100,000
Summer 2024	Best Student Paper Award , CVPR Workshop on EarthVision	
2015 - 2019	ASEAN Undergraduate Scholarship , National University of Singapore	\$ 200,000

Invited Talks

- Fall 2025 **Operator Learning for Climate Modeling Across Scales**, University of Utah
- Spring 2025 **Subseasonal-to-Seasonal Climate Predictability**, Stanford University
- Fall 2024 **Climate Predictability Across Timescales: A Probabilistic Machine Learning Perspective**, UCLA
- Fall 2023 **Understanding and Modelling the Earth System with Machine Learning**, German Aerospace Center
- Spring 2023 **Meta-learning for Environmental Sciences**, University of Reading

Teaching Experience

- Fall 2025 **EAEE 2100**, A Better Planet by Design
- Fall 2024 **EAEE 4000**, Machine Learning for Environmental Engineering and Science